Notebook, N-04-05-10

This non-standard-size notebook covers the period July 1903-November 1904. The first 59 pages contain notes by unidentified experimenters regarding storage battery endurance tests, along with a few log entries for shipments of electrolyte solution and cells. Beginning on page 67 is a series of notes by Edison on endurance tests. Six loose pages of notes regarding the battery experiments have been inserted into the book, the first two of which contain instructions by Edison. The book contains 253 numbered pages. Approximately 60 pages have been used. Many pages are blank; pages 65-66 have been removed from the book.

Only the material by Edison has been selected.

Group to see at what rate the loss of ampere capacity goes on –

Group No 1 – Three new cells from factory that have never been charged but have been washed in the regular way Numbered 5175 – 5154 4788.
Cells filled with 750 cc 33% and balance with 21% KOH. Ni mix 388 Fe mix. 603.

5175 has 388 Ni + 603 Iron
5154 " "
4788 has 326 Ni + 597 Iron + Old gauze Top.
4812 " " New Top

Group to ascertain of chlorine medium will prevent loss of capacity —

Group No 2 - Three new cells never been charged but washed in regular way No 4655 4510 4770 750 cc 33% KOH to which is added + dissolved six grams of potassium chloride balance cell filled with 21% - to one cell. add 6 grams KCl No 4655 - to another cell No. 4510. add 18 grammes of KCl to the 33% and to the third cell No 4770. add 36 grammes KCl to the 33% KOH.

M mix 388 F mix 603

Group to prove if washing iron in addition to Ni flow is beneficial — originally

Group 3. No 5223 5177 5159.
Ni mix No 388 Fe mix No 608. all new plates, the nickel plates are each to be put in a receptacle between iron sheets and given a reverse charge of 50 amperes for 3 minutes in cold KOH 20% — being permitted to soak for 15 seconds before current is put on. (then put on charge) The iron plates are to be assembled into a group and charged against a can [not reverse] the can being kept to 150 Fahr. charge is to be for 15 hours at 60 amperes. Then put the iron group in new can with fresh KOH, cold and reverse to discharge the iron at 40 amp rate until it is reversed and the iron can be removed without self heating. Then assemble the cells in the regular way without the washing process, seal and add KOH to give the right per cent. The nickel plates as they come off the 50 amp 3 minute charge are to be kept in distilled water until ready to assemble,

Group. to see if it is necessary to wash the non Electrolytically and to see if regular washing will answer.

Group 4 –

Nos 5162. 5134 5141 – Mix No 388.

72 mix No ____

Reverse each nickel plate 50 amp in cold KOH 21% for 3 minutes each plate as done put in distilled water Each plate soaked 15 seconds before the 50 amp reverse charge. – These plates are to go to Cleaner and assembled with non plates in Regular way, welded and washed in regular way and KOH put in reg to get right % KOH.

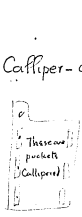
Charged 6 hours at 48 amp by mistake

Plate 7 Dry

0	15 Edge	25	27
	91	98	102
	101	111	111
	87	95	97
	91	102	99
	84	93	96
	93	103	100

Calliper – of plates (4) of Group 4

Plate 7 after Electro wash



Edge	Center	Edge
101	100	105
114	106	112
99	95	100
104	99	101
97	95	99
106	100	103

first plate had Columns wrong but figures are OK

Plate 8 Dry

Center.	Edge	Edge
92	100	103
89	101	101
89	99	99
94	108	105
108	115	110
88	100	98

Plate 8 Electro washed

Edge	Center	Edge
103	103	105
103	99	104
103	95	102
107	104	108
115	115	114
104	95	99

Plate 9 Dry

Center.	Edge	Edge
88	96	99
82	94	94
85	95	95
92	100	103
91	103	101
87	99	98

Plate 9 Electro washed

Edge	Center	Edge
101	100	103
98	94	98
98	95	98
104	101	106
108	103	105
102	98	101

Plate 10 Dry

Edge	Center	Edge
100	90	102
103	92	103
89	81	92
101	95	105
95	85	95
93	81	92

Plate 10 Electro washed

Edge	Center	Edge
104	101	105
106	103	107
93	93	95
108	108	110
99	94	98
96	94	97

Plate 11 Dry

Edge	Center	Edge
106	98	109
108	95	105
102	93	102
108	98	108
106	97	109
99	88	100

Plate 11 Electro washed

Edge	Center	Edge
108	109	113
111	104	108
107	104	107
110	107	111
110	107	110
103	100	102

Plate 12 Dry

Edge	Center	Edge
93	84	98
97	85	96
93	85	96
106	98	106
92	82	93
95	88	98

Plate 12 Electro washed

Edge	Center	Edge
97	98	102
101	95	100
99	97	98
110	110	111
96	94	97
104	101	104

Group to prove if electrolytic washing is better at high temp -

Group 5 Calls 5107 5137 5106.

Ni mix 388 Fe mix —

Each nickel plate recovered in 21% KOH kept at 150 Fahr - 50 amp for 3 minutes and plates put in distilled water, send to Glen R assembly, with non, water and wash requisiv, put in right % KOH.

Calyper. 5106 -- plate 1.

E	C	E	Dry	after 50 amp 3 min hot		
98	88	100		103	103	106
91	77	88		94	88	91
93	86	95		97	95	98
96	86	96		100	96	100
89	81	92		98	92	94
94	85	96		98	95	99

5106 Plate 2

			after 50 amp 3 min hot		
92	83	95	96	97	100
95	85	95	100	98	100
100	91	101	106	103	106
103	94	102	108	105	108
103	91	101	107	105	105
104	93	104	109	107	108

Group 5

Plate 5137 - No 4

100	85	99
100	84	97
105	90	103
107	92	106
105	93	102
103	93	106

after 50 amp hot 3 min

103	94	101
103	99	101
107	103	105
108	103	108
108	104	104
106	104	110

Plate 5107 - No 5

111	101	111
96	85	99
107	98	107
113	107	104
100	88	100
94	84	98

after 50 amp 3 min hot

115	112	115
99	95	102
112	108	112
117	113	116
104	100	107
97	94	101

Plate No 6

92	85	99
100	100	100
99	90	101
109	100	106
96	86	98
100	89	100

after 50 amp 3 min hot.

96	91	102
114	112	115
105	104	105
112	110	110
101	98	102
105	102	105

Average swell 10.66 -

Group to prove if Electrolytic washing is better if continued for longer time,

Group 6 Nos 5090 5138 5148.

Nitric 388 °/z mix 603

Reverse charge each nickel plate 50 amp for 20 minutes,

Cold Rol # 2½ - put in distilled water, take to Plank assemble with [illegible] and wash in [illegible] put Rol Reg m. -

Jar got 10° hotter than atmos temp -

Caliper - 5138 - plate 22

Dry			After 50 amp 20 minutes		
100	88	100	103	101	103
105	90	102	108	106	107
102	92	103	109	109	109
95	88	98	101	102	103
103	90	103	108	107	108
98	93	104	107	113	111

plate 21 5138

Dry			After 50 amp 20 min		
102	85	100	105	99	102
97	81	95	100	94	98
103	87	101	107	100	103
97	84	97	101	97	99
94	80	95	98	95	98
99	89	101	98	101	104

Group 6

5148 – Plate 23

Dry			After 50 amp 20 min		
a	c	e	a	c	e
100	85	100	104	101	103
101	86	99	108	105	104
104	91	100	110	108	107
103	88	103	108	107	106
99	85	99	106	106	104
101	92	105	106	108	110

5148 – Plate 24

Dry			After 50 amp 20 min		
a	c	e	a	c	e
88	74	88	112	108	115
94	79	94	95	89	94
95	83	95	97	92	96
95	83	96	99	96	98
99	85	100	103	100	104
97	88	99	101	101	102

No 5090 Plate 19

Dry			After 50 amp 20 min		
a	c	e	a	c	e
98	82	98	103	99	102
92	78	91	95	93	95
99	87	99	103	99	102
99	87	101	105	101	102
95	83	96	99	96	99
97	89	100	101	101	105

Average swell 16·22–

5090 Plate 20

Dry			After 50 amp 20 min		
a	c	e	a	c	e
86	79	88	89	91	91
89	80	89	93	94	94
100	89	100	104	105	103
88	78	89	93	95	94
92	80	90	96	96	95
90	81	88	96	96	94

Group to prove if old cells can be brought back by electrolytic washing —

Group 7 Nos 5110 5122 5173

Ni mix No 219 Fe No — E45-60's 232 / 237 / 237 / 237 Peter mixed,

Enough plates from a bad E 45 cell Gibbs truck has ni plates reversed in cold KOH. 50 amp 3 minutes put in distilled water then taken to GR and assembled with fully discharged iron from same cell. wold + wash regular way + put right KOH in.

Calliper of 4 plates Group 7.

Cell 5122 - plate No 34

Dry Edge	Dry Center	Dry Edge	after 50 amp 3 min Edge	Center	Edge
108	107	107	108	107	107
106	105	104	106 -	105 -	104
103	106	107	103	104	105
110	110	112	111	111	113
106	104	105	105	104	104
109	106	107	109	109	107

Cell 5173 plate 35 -

Dry Edge	Dry Center	Dry Edge	after 50 am 3 min - Edge	Center	Edge
112	112	113	112	112	112
112	110	109	113	110	109
111	110	110	111	110	109
112	112	112	112	113	113
113	112	113	113	112	113
108	108	108	107	108	109

Group 7

Cell 5122 plate 33

Dry			After Chg 50 amp 3 min		
Edge	Center	Edge	Edge	Center	Edge
103	103	102	102	103	102
111	109	108	111	109	109
108	108	109	107	109	108
108	108	108	108	110	108
112	112	111	113	112	112
106	104	102	106	104	102

Group 7

Cell No 5173 plate 36-

Dry			After 50 amp 3 min		
Edge	Center	Edge	Edge	Center	Edge
108	111	110	120	112	110
105	104	104	105	104	104
107	104	106	107	106	106
105	106	106	106	106	107
107	107	109	108	107	110
108	108	109	108	110	110

Group 7-

Cell 5110 plate 31-

Dry			After 50 amp 3 min		
Edge	Center	Edge	Edge	Center	Edge
105	107	108	107	108	108
110	107	107	109	109	107
111	111	111	110	111	111
108	107	107	108	108	107
108	107	110	108	107	109
110	111	110	107	107	107

Cell 5110 plate 32

Group 7=

Dry			After 50 amp 3 min		
Edge	Center	Edge	Edge	Center	Edge
103	103	103	110	111	110
108	108	108	103	103	103
106	105	105	108	109	108
106	106	104	105	105	106
103	105	106	105	107	107
108	107	108	110	107	108

After 56 ch taken out & finished 24 hrs ch on board.

56th Run.	5122 —	120 —	124
	5173 —	128½ —	124
	5110 —	127½ —	128

After 56 runs reversed Ni against can, 15 hrs at 60 Amp at 150° F. Then changed KOH & charged 24 hrs at 40

57 Run. Cell	5122 —	150	158½
"	5173 —	157½	158½
"	5110 —	158½	157½

Charged 12 hrs @ 50 & put back on insurance

After Run 62 stood after ch for 6 days while balance of cells being tested

" " 63 They fell below a volt at 120 amp.

After Run # 69 they were cut out of the test & the following treatment given to them.

Charge 24 hrs at 40 & run @ 30 amp.

Run 70 =

Then if bad reverse the Ni. alone against the can at 60 Amp for 24 hrs & note temp.

Then charge 24 hrs @ 40 amp

Run 71 =

Group to see if rejuvination of Ni cell is improved by electrolytic wash in hot KOH as against cold KOH —

Group 8 No 5125 5092 5170

Ni mix 7 Fe Mix — Bad E 45 Gibbs No: 1257 1291 1322 1362 Plates removed.

Reverse each Nickel plate in hot (150 fahr) 21% KOH.

50 amperes for 3 minutes and put in distilled water, assemble with Iron plates from same cell.

wash regular + put right KOH in

All the Callipers are the same after reverse as original only a few variations now and then, both ways —

In this experiment the radicals are deposited on the cathode of the cell into the new Kott—

Experiment to see if can not charge) water by difference in comp and to group 10

Group 9
No #5075 *5102 2392 #4098 E45-(272 Ka. 5070 Ka.)
0.28 56

Plates from E45 Gibbs cell Truck poor cell, from E45 No 2 Reverse not to can not get to can by using asbestos, leave it in the original can and change Kott, + While reversing keep temp 150 Fahr,

* Cell #5075 + 2392 were short circuited + were replaced by Cell #5235 + 5712 made from #1511 & #5(g)(5)2 (on his 1st step)
These cells were treated as above + charged up for 24 hrs + then charged 12 hrs + put in the series with group 9 Nov 1. P.M.

Group to see if the electrolytic washing in can itself cut high temp will bring back capacity.
retain it – In this 2 put the radicals deposited on the can are eliminated by using a new can

Group 10 – Nos 5173 ~~5137~~ 5186.

Ni mix 219 Fe mix 419 E as Nos {222, 224, 225, 137} plates mixed.

Cells made up of plates from group 245 battery that has lost capacity – Reverse the nickel against the can surrounded with asbestos to get 150 Fahr. Use 60 amperes for 15 hours. Then put in new can with fresh KOH. Dont wash neg

5131 is short circuited + cut out.

To see the effect of a longer Electrolyte washing at high temp on a new cell of Nickel only —

Group 11 Nos 5135 5118 5174.

Ni mix 388 Fe mix 603

Charge reverse the nickel plates 50 amp for 20 minutes each in KOH. 21% at temp of 150 Fahr assemble with new vents + wash regulator, + put right quantity KOH in —

Cell open - 5174 Plate 16

Edge	Centre	Edge
102	88	99
104	88	102
106	93	105
98	87	99
95	83	96
97	89	98

After 50 amp 20 min heat.

106	98	102
108	105	105
110	106	109
101	97	102
100	94	99
102	100	100

Cell 5135 - plate 17

91	82 (24)	92
95	87	93
87	79	90
91	82	91
89	80	90
81	77	85

After 50 amp 20 min

95	94	97
98	98	97
90	89	92
95	91	93
93	92	95
85	90	91

Cell 5135 plate 18

97	88	97
101	90	99
105	92	103
91	80	89
99	88	99
89	83	91

after 50 amp 20 min -

101	97	100
105	102	103
108	105	106
93	90	90
102	99	102
92	90	93

Group 11-

Cell 5118-plate 13

E	C	E
104	97	109
87	78	85
87	80	91
87	77	88
91	79	90
89	81	88

after 20

E	C	E
105	105	112
89	88	89
90	90	94
90	88	91
94	92	93
93	95	93

Cell 5118-plate 14

94	84	95
89	78	86
86	78	88
82	73	78
89	76	83
83	78	85

96	97	98
92	89	89
88	85	87
84	81	77
90	85	84
85	84	88

Cell 5174 plate 15

81	76	85
80	71	79
87	78	88
92	80	93
100	89	100
87	80	89

95	88	88
82	82	83
90	92	93
97	95	95
106	105	105
93	96	95

average growth 11.26-

Group to see if its beneficial to electrolyphoid wash Fe as well as Ni –

Group 12 – No 5132 5126 5063
Ni mix 388 Fe mix 603
Reverse both the nickel and iron plates each seperately in Cal cl 21% KOH, at 50 amp 3 minutes put in distilled water, then dry & assemble put in right KOH. do not wash regular, This is the way Rogers & Madelenes old C cells were treated as far as we can learn from Fleiss & Monahan, We mean Ni Cathode & Iron on Cathode as well –

To see if long soaking of new Ni plates before electrolytic washing is beneficial

Group 13 -

Nos ____

Ni mix Fe mix.

Nickel plates soaked in 21% all night and then separately given a reverse charge in cold KOH, 21% at 50 amp for 3 minutes, put in distilled water assembled & washed; neg wrap & neg KOH put in.

Decided not to run this on account of following Experiment. Took dry plate, calipered at center

Dry	after $2\frac{1}{2}$ hours soak in KOH	after 3 min 50 amp
88	94	98
88	95	97
92	97	100
88	94	95
103	107	111
91	97	100
91.166	97.33	102

The gas swell is only 5.66 whereas without soak it averages 10.5 We think that the gas swell is the best of porosity is the right theory -

GROUP 14

Nos 5103 5139 5227

Ni mix 388 Fe mix 603

~~Group of nickel plates put in a can and charge reverse in KOH 20% cold at 100 amperes for the group for six hours, then put in new can with new irons, weld and wash regular reg KOH.~~

Assemble cell with irons + nickels put in can and connect both nickel and iron poles together + use the can for the other pole. so both Ni + Fe will be Cathodes and Can anodes. use 100 amp for 6 hours remove plates dip immediately in distilled water* and transfer to new can filled with KOH, + weld

*We change KOH, + put fresh dose of 21% KOH + run for ½ hour longer so the proportion of bad KOH in the pores will be diminished. We use 21% for fear the bad substance may not be soluable in weaker solution. then when dip into distilled water. Cells were not exposed for more than 3 minutes Except 5227 which came over with no KOH in it it did not heat.

77
50
157
77
234

GROUP 15.

Nº 5335 5304 5685

Ni mix 388 Fe mix - 603

Group of new nickels plates reversed against CP nickel sheet in a porcelain jar at *175° for 30 amp for 24 hours. assemble with regular iron group. wash the iron group regular in a seperate arm. Assemble - dont wash any more.

* Av. temp. during the reversal was 120° F.

GROUP 16.

Nos 5697 5667 5692

Ni mix 2 cells (388) 1 in (390) Fe mix #603

Group of nickels reversed against a CP nickel sheet in a ~~porcelain~~ glass jar at 175° Fahr 30 amp 48 hours. Assemble with irregular iron group wash the iron group regular in a seperate box. Assemble – don't wash any more.

This group & 17-18 & 19 were welded with special care by Ferguson & the cons were made of the best steel they could get for welding, Observe for leakes.

Group 17
Rods 5688 ✓ 5239 ✓ 5294 ✓
Nimix 388 Fe. mix 603
Group of Nickels reversed against a CP nickel sheet in a porcelain jar at 175° Fahr 30 amp 24 hours – Assemble with an iron group which has been made Cathode, with a CP nickel strip as an Anode in a porcelain jar at 175° Fahr 30 amp 24 hours – Assemble – don't wash – Be careful not to self heat assemble quickly and weld quickly – get ROH in as soon as possible –

Note Oct 31 – midnight cells ok. Nov 1 at 10 am found one iron group against the strip. Cell No _____.
10 am fixed it,

GROUP 18

No° 5620 5686 5562

Ni mix 388 Fe mix 603

Group of nickels removed against a CP nickel plate in a porcelain jar at 175 Fahr 30 amp for 24 hours, Assemble with an iron group which has been made ANODE in a porcelain jar at 175° Fahr 30 amp for 24 hours assemble dont wash, save the nickel sheet for analysis of the deposit and passivated in distilled water.

GROUP 19

Nos 5621 5678 5416

Ni 388 Fe. 603 Ni 388 Fe 603 Ni 388 Fe. 603

Regular cell, washed regular but not charged put in right KOH, & WQ to add Millon_

Cells were filled with C.P. 24% KOH that is 24% KOH which had been treated with millons base until free of chlorides etc. The sp.gr. made OK. for 21%.

25 cc. wet millon's base precipitate added to each cell during the first charge.

GROUP 20 (a)

No 5708 5140 5147

Ni mix 388 Fe mix 603

New cells with new die for crimping both nickel and iron, washed requlex and acid to laboratory for test against requlex die previously used — (see 20(b)) page 223

Group 20(b)

Cells No.s 5117 5123 5128 Ni 388 Fe 597

Ni mix No 388 (first two) Fe Mix No 603 (first two)

New cells with ~~old~~ die for crimping both Fe + Ni. Washed regular Charged 24 hrs. @ 40 + Discharged to .75 @ 30 Then charged 12 hrs @ 50 + put on endurance test.

GROUP 21

No. 373 369 375

Ni mix 7½ mix -

Rogers battery - This is a battery, having a record as below - put in new KOH. Charge 24 hours and get sure use six cells and pick out 3 good ones

	Cell 373		Cell 369		Cell 375	
	V	.75	V	.75	V	.75
Original Run.						
11/3/04	140	154½	156½	180	153	182

Group 21 (b)

Cell Nos. 5117 5123 5128

GROUP 22

No 5315 — 5657 ✓ 5552 ✓

Ni mp 388 Zn mp 603

Group of nickels rivetted against CP nickel strips in glass jar surrounded by asbestos 48 hours 1st 24 hours temp averaged 128 F. incandescent lamps put in box & covered with asbestos Temp averaged 142 Fahr for 15 hours, finally for 9 hours temp averaged 128 Fahr —

Nickel strips colored brown which rubbed off, but after that in was darkish & wouldn't rub off

Solution after settling 10 hours was very cloudy pure white, & after 24 hours is still strongly white cloudy

Make another group of old cells, which have had some long record & needs reversing
Charging only Ni against Can
Have got to find a method which
will bring cells back that have
gone bad & will charge Can
& Can be done all over the Country.

E.18

GROUP 23

No. 1269 — Ni 1141 - Fe 397 — Ni 1117

1004 — Ni 1141 Fe 401 — Fe 1141 f

440 — Ni 1141 Fe 337 — after was cut out removed.

Cells which have gone bad and need reversing. Reverse hot at 150 Fahr Asbestos Nickel to Can Iron to can, both being cathode 24 hours at 40 amperes. Change potash, change 24 hours, notwithstanding previous attempts changed discharge to 75 v. Reduce 12 hours 40 + out an Endurance

*

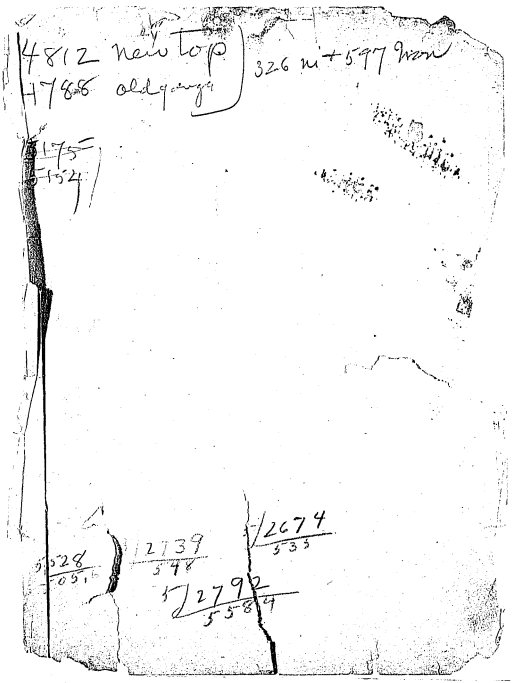
Jobs Run	# 1269 V	.75	% Loss	# 1004 V	.75	% Loss	# 440 V	.75	% Loss
original at A.R. 24 hrs at 40	140			140			130		
Run at Lab. before treatment									
Run @ Lab. after treatment									

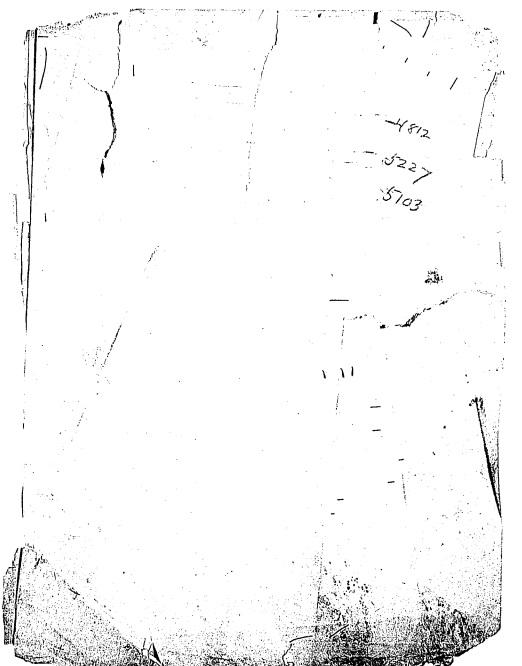
[ITEM FOUND IN BOOK]

(7) 1 quart 60 camp 24 hours
(8) 1 " 15 " 48 hot 120 Tabs
(9) 1 " 60 " 24 hours under
Kill pounds and Water put in
4 allowed soak bed & Rooms

~~1 quart [illegible] 120 t~~
~~bottles 9 hrs.~~

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

[ON BACK OF PRECEDING PAGE]